Study of Histological Changes in the Soleus Muscle Post Hemorrhagic Stroke

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Introduction

- Normal nuclei in skeletal muscle are peripherally located.
- Centralized nuclei indicate muscular injury[1]
- Centrally located nuclei are a common feature in stroke [2]
- Little is known about the muscle physiology principles that specifically address limb muscle weakness after stroke.

Objective

- **Research Question**:

Does soleus muscle show signs of *mechanical injury with or without signs of repair* after a hemorrhagic stroke?

- **Hypothesis**:

Soleus muscle on the limb opposite the side of the brain's stroke lesion will have increased signs of injury compared to controls at 2 weeks post-stroke.

Methodology

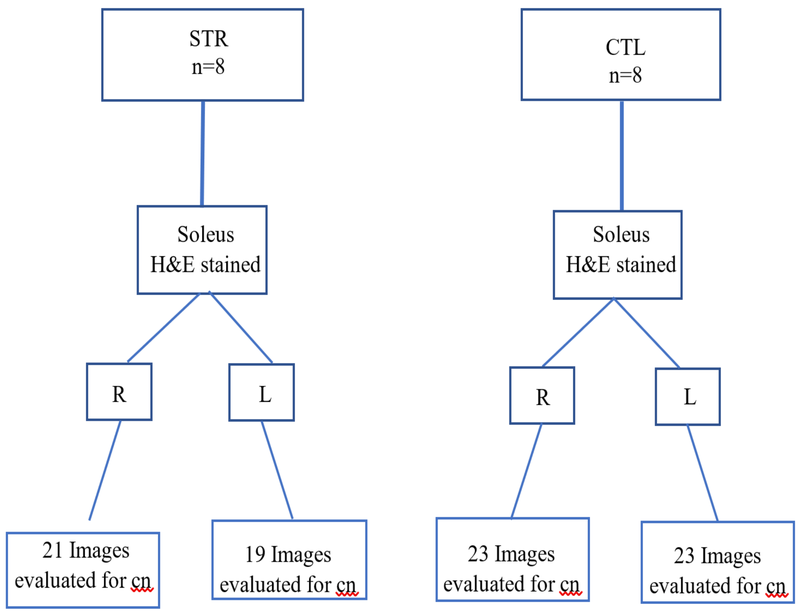

Figure 1: Organizational Chart Digital images were obtained at 200x magnification. The stroke (STR) data was then compared to the control (CTL) group. Two sample t-tests were used to compare the means of the two randomly assigned, independent groups as noted below. Significance level set at $p \leq 0.05$.

Methodology

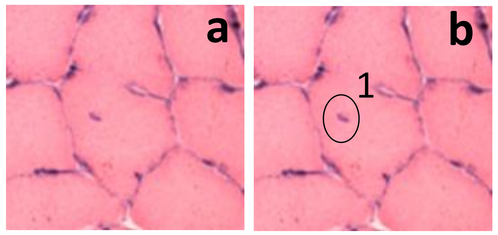

Figure 2: **Soleus muscle in a rat 2 weeks after stroke**. **a,b**- H&E; **a-**normal tissue sample **b**- markings applied to identify and number the centralized nucleus

Results

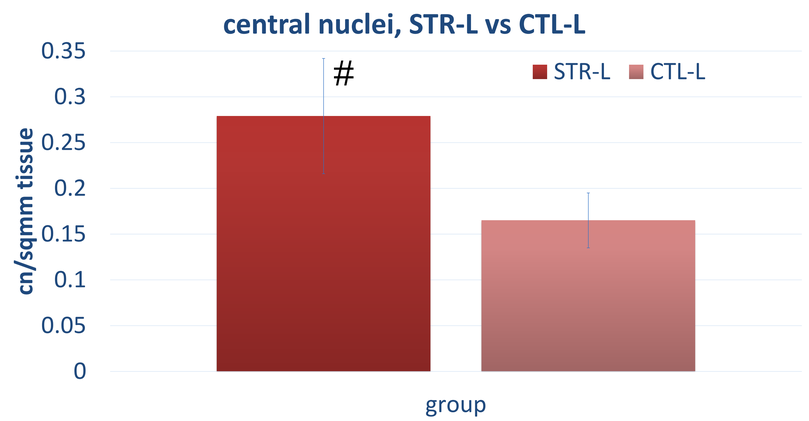

Figure 3. central nuclei, STR- L vs CTL-L # Trend, STR-L >CTL-L (STR-L 0.28+/- 0.06 vs CTL 0.61+/-0.03**; p=0.07**).

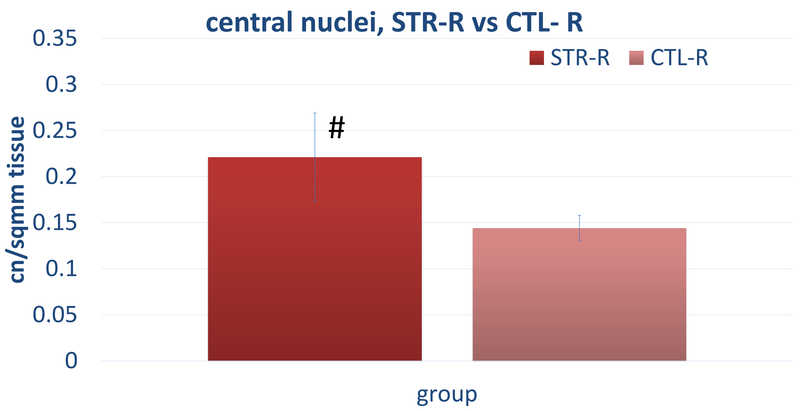

Figure 4. Graph of STR- R vs CTL-R # Trend STR-R vs CTL-R (STR-R 0.22+/- 0.05 vs CTL-R 0.14+/-0.01; **p=0.09**).

Results

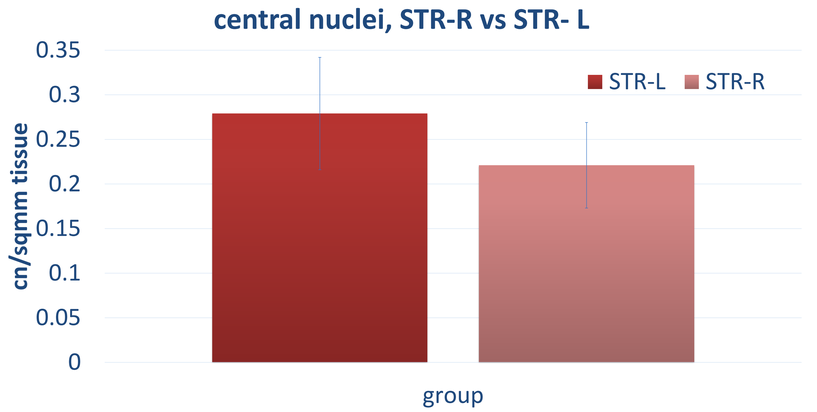

Figure 5. central nuclei, STR- R vs STR-L No difference STR-L vs STR-R (STR-L 0.28+/- 0.06 vs STR-R 0.22+/- 0.05; **p=0.5**).
Similar results were found comparing CTL-L vs CTL-R (CTL-L 0.16 +/- 0.03 vs CTL-R 0.14 +/- 0.01: **p=0.5**)

Conclusion

- STR soleus shows more centralized nuclei than CTL soleus bilaterally
- May indicate increase in mechanical damage on stroke muscle compared to controls
- Provides clinicians and researchers with more information on plasticity of muscle after stroke
- New knowledge may influence ability to provide optimal rehabilitation treatment to persons who post-stroke

The translational information obtained using rat samples in this **undergraduate research opportunity** has added to the understanding of the physiology of muscle post-stroke.

Literature Cited

[1]Dubowitz, V., Oldfors, A., & Sewry, C. A. (2013). *Muscle biopsy: a practical approach*. Oxford: Saunders, Elsevier.
[2]Scelsi, R., et al. (1984). Hemiplegic atrophy: Morphological findings in the anterior tibial muscle of patients with cerebral vascular accidents. Acta Neuropathologica

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